

Claims

1. A hybrid fuel cell comprising:
a fuel cell portion; and
an electrolytic cell portion;
said fuel cell portion and said electrolytic cell portion
being adapted to operate alone or in tandem.
2. The hybrid fuel cell according to claim 1, wherein said
hybrid fuel cell further comprises an anode section including one
or more anodes.
3. The hybrid fuel cell according to claim 2, wherein said
anode section is shared between said fuel cell portion and said
electrolytic cell portion.
6. The hybrid fuel cell according to claim 2, wherein said
anode comprises a hydrogen storage material and/or Raney nickel.
7. The hybrid fuel cell according to claim 6, wherein said
anode comprises 0.0 to 88.0 weight percent of said hydrogen storage
material, 0.0 to 88.0 weight percent Raney nickel, 4.0 to 12.0
weight percent of a binder material, and 0.0 to 5.0 weight percent
of a conductive material.

8. The hybrid fuel cell according to claim 7, wherein said conductive material comprises graphite or graphitized carbon.

9. The hybrid fuel cell according to claim 7, wherein said hydrogen storage material comprises Rare-earth metal alloys, Misch metal alloys, zirconium alloys, titanium alloys, magnesium/nickel alloys, or mixtures thereof.

10. The hybrid fuel cell according to claim 2, wherein said fuel cell portion comprises at least one cathode, said cathode being in electrical communication with said anode section.

11. The hybrid fuel cell according to claim 10, wherein said cathode comprises a carbon matrix with an active catalyst material catalytic toward the dissociation of molecular oxygen dispersed therein.

12. The hybrid fuel cell according to claim 11, wherein said active catalyst material is selected from silver, silver alloys, silver oxide, cobalt, cobalt oxide, cobalt manganese oxide, nickel, manganese oxide, manganese dioxide, pyrolyzed macrocyclics, or combinations thereof.

13. The hybrid fuel cell according to claim 11, wherein said

cathode further comprises a peroxide decomposing material.

14. The hybrid fuel cell according to claim 2, wherein said electrolytic cell portion comprises at least one oxygen evolution electrode, said oxygen evolution electrode being in electrical communication with said anode section.

15. The hybrid fuel cell according to claim 14, wherein said oxygen evolution electrode comprises an electrocatalytic material deposited on a substrate.

16. The hybrid fuel cell according to claim 15, wherein said electrocatalytic material comprises a host matrix and at least one modifier element disposed therein.

17. The hybrid fuel cell according to claim 16, wherein said host matrix comprises at least one transition metal element.

18. The hybrid fuel cell according to claim 16, wherein said at least one modifier element is selected from Co, Ni, Sr, Li, K, In, Sn, C, Mn, Ru, Zn, Al, and combinations thereof.

19. The hybrid fuel cell according to claim 15, wherein said electrocatalytic material comprises Ti and Ru.

20. The hybrid fuel cell according to claim 15, wherein said electrocatalytic material is deposited on said substrate via sputtering, vapor deposition, electro-deposition, thermal spraying, plasma deposition, or spraying.

21. The hybrid fuel cell according to claim 14, wherein said oxygen evolution electrode comprises a conductive material selected from nickel, steel, titanium, graphite, copper, and combinations thereof.

22. The hybrid fuel cell according to claim 21, wherein said conductive material is the form of an electrically conductive mesh, a grid, a foam, an expanded metal, or combinations thereof.

23. The hybrid fuel cell according to claim 1, wherein said electrolytic cell portion is adapted to accept an electrical current from a source of power external to said hybrid fuel cell.

24. The hybrid fuel cell according to claim 1, wherein said fuel cell portion and said electrolytic cell portion share an electrolyte.

25. The hybrid fuel cell according to claim 1 further comprising a hydrogen storage unit adapted to store hydrogen

produced from said electrolytic cell portion in gaseous, liquid, or metal hydride form.

26. The hybrid fuel cell according to claim 1 further comprising an oxygen storage unit adapted to store oxygen from said electrolytic cell portion in gaseous, liquid, or oxide form.